

WHAT IS CLAIMED IS:

1. A pressure-contact type semiconductor device having an outer peripheral gate structure which includes an external cathode electrode, an external anode electrode and
5 an external gate terminal for flowing an electric current at a time of turn on/off operation, said semiconductor device comprising:

a semiconductor substrate having an outer peripheral step portion thinned in thickness thereof, said
10 semiconductor substrate having a gate electrode and a cathode electrode formed on a top surface side of the substrate, and an anode electrode formed on a back surface of the substrate; and

a pressure-contact supporting block which is provided
15 in an inner periphery of the external gate terminal and located on the gate electrode,

wherein the gate electrode is formed on the top surface of the outer peripheral step portion of the semiconductor substrate so as to face the pressure-contact
20 supporting block,

wherein a convex contacting portion is formed at a predetermined position of a top surface of the gate electrode so as to contact the pressure-contact supporting block, and

25 wherein an insulation film is formed on a surface area

of the gate electrode, ranging from an inner periphery of the gate electrode to a position adjacent to the convex contacting portion.

5 2. The pressure-contact type semiconductor device according to claim 1, wherein said gate electrode is comprised of a first gate electrode and a second gate electrode, the first gate electrode is formed on the outer peripheral step portion of the semiconductor substrate so
10 as to face the pressure-contact supporting block, the second gate electrode is formed as the convex contacting portion contacting the pressure-contact supporting block.

 3. The pressure-contact type semiconductor device
15 according to claim 1, wherein said convex contacting portion provided on the surface of the gate electrode is integrally formed with the gate electrode.

 4. The pressure-contact type semiconductor device
20 according to claim 1, wherein said gate electrode is comprised of a first gate electrode and a second gate electrode, the second gate electrode is formed on the surface of the outer peripheral step portion of the semiconductor substrate so as to face the pressure-contact
25 supporting block, and the first gate electrode is formed so

as to overlay the second gate electrode, and the convex contacting portion contacting the pressure-contact supporting block is integrally formed with the first gate electrode.

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5. The pressure-contact type semiconductor device according to claim 3, wherein the gate electrode covers a protrusion which is integrally protruded from the surface portion of the outer peripheral step portion of the semiconductor substrate, and the convex contacting portion integrally formed with the gate electrode is formed to overlay the protrusion.

6. The pressure-contact type semiconductor device according to claim 1, wherein said gate electrode is comprised of a first gate electrode and a second gate electrode, the first gate electrode overlays a protrusion which is integrally protruded from the surface portion of the outer peripheral step portion of the semiconductor substrate, and the second gate electrode is formed on the first gate electrode so as to serve as the convex contacting portion.

7. A pressure-contact type semiconductor device having a center gate structure which includes an external

cathode electrode, an external anode electrode and an external gate terminal for flowing an electric current at a time of turn on/off operation, said semiconductor device comprising:

5 a semiconductor substrate having a center concave step portion at a center portion thereof, said semiconductor substrate having a gate electrode and a cathode electrode formed on a top surface side of the substrate, and an anode electrode formed on a back surface of the substrate; and

10 a pressure-contact supporting block which is provided in an inner periphery of the external gate terminal and located on the gate electrode above the center concave portion of the substrate,

 wherein the gate electrode is formed on the surface of
15 the center concave step portion of the substrate so as to face the pressure-contact supporting block,

 wherein a convex contacting portion is formed at a predetermined position of a top surface of the gate electrode so as to contact the pressure-contact supporting
20 block, and

 wherein an insulation film is formed on a surface area of the gate electrode, excluding a position of forming the convex contacting portion.

25 8. The pressure-contact type semiconductor device

according to claim 7, wherein said gate electrode is comprised of a first gate electrode and a second gate electrode, the first gate electrode is formed on the surface of the center concave step portion of the semiconductor substrate so as to face the pressure-contact supporting block, the second gate electrode is formed as the convex contacting portion contacting the pressure-contact supporting block.

9. The pressure-contact type semiconductor device according to claim 7, wherein said convex contacting portion provided on the surface of the gate electrode is integrally formed with the gate electrode.

10. The pressure-contact type semiconductor device according to claim 7, wherein said gate electrode is comprised of a first gate electrode and a second gate electrode, the second gate electrode is formed on the surface of the center concave step portion of the semiconductor substrate so as to face the pressure-contact supporting block, and the first gate electrode is formed so as to overlay the second gate electrode, and the convex contacting portion contacting the pressure-contact supporting block is integrally formed with the first gate electrode.

11. The pressure-contact type semiconductor device according to claim 9, wherein the gate electrode covers a protrusion which is integrally protruded from the surface portion of the center concave step portion of the semiconductor substrate, and the convex contacting portion integrally formed with the gate electrode is formed to overlay the protrusion.

12. The pressure-contact type semiconductor device according to claim 7, wherein said gate electrode is comprised of a first gate electrode and a second gate electrode, the first gate electrode overlays a protrusion which is integrally protruded from the surface portion of the center concave step portion of the semiconductor substrate, and the second gate electrode is formed on the first gate electrode so as to serve as the convex contacting portion.

13. The pressure-contact type semiconductor device according to claim 5, wherein a cross-section of the protrusion integrally formed on the semiconductor substrate has a taper shape which becomes narrower to the top thereof.

14. The pressure-contact type semiconductor device

according to claim 7, wherein the gate electrode facing the pressure-contact supporting block is formed at an intermediate position of the semiconductor substrate.

5 15. The pressure-contact type semiconductor device according to claim 2, wherein the second gate electrode is made of an electrode material which is less oxidative than at least an aluminum material.

10 16. The pressure-contact type semiconductor device according to claim 2, wherein the second gate electrode has a multilayer structure made of different types of materials.